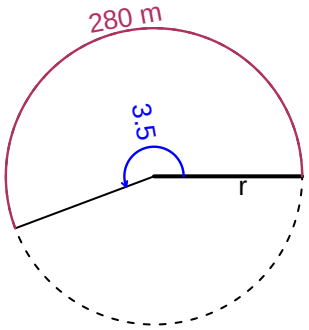
Name: Date:

Trig Final (SLTN v655)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.5 radians. The arc length is 280 meters. How long is the radius in meters?

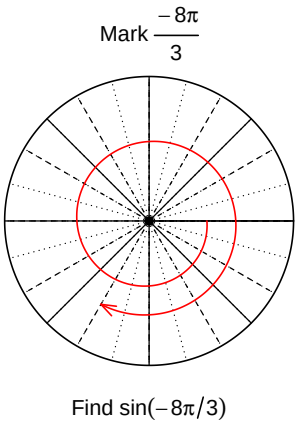


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

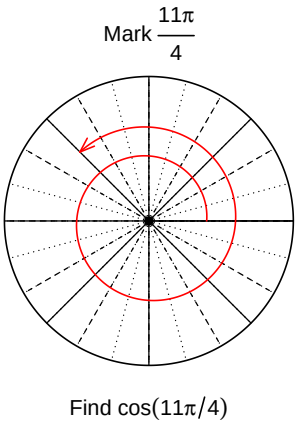
$r = 80$ meters.

Question 2

Consider angles $\frac{-8\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-8\pi}{3}\right)$ and $\cos\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-8\pi/3)$



Find $\cos(11\pi/4)$

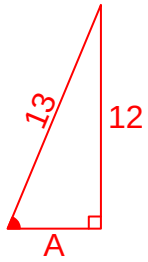
$\sin(-8\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-12}{13}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

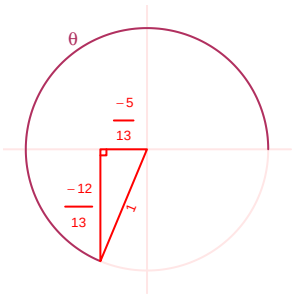
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 12^2 = 13^2$$
$$A = \sqrt{13^2 - 12^2}$$
$$A = 5$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-5}{13}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 4.92$ meters, a frequency of 8.18 Hz, and an amplitude of 2.28 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.28\cos(2\pi 8.18t) + 4.92$$

or

$$y = 2.28\cos(16.36\pi t) + 4.92$$

or

$$y = 2.28\cos(51.4t) + 4.92$$